

Net Zero Plus JCTD Results : Evaluation of Energy Saving Technologies for Expeditionary Shelters



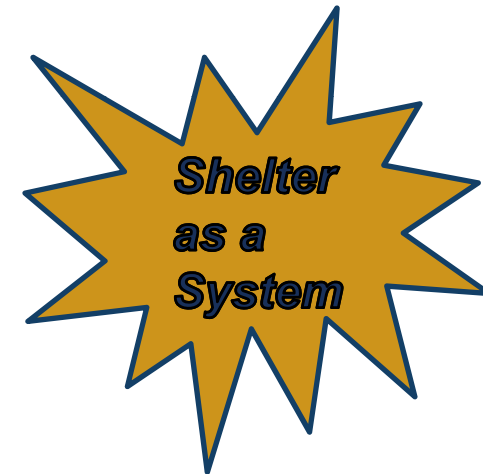
Laura Biszko
Special Projects Team
NSRDEC
508-233-4499

10/03/2011

UNCLASSIFIED

Report Documentation Page				Form Approved OMB No. 0704-0188	
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE 03 OCT 2011		2. REPORT TYPE		3. DATES COVERED 00-00-2011 to 00-00-2011	
4. TITLE AND SUBTITLE Net Zero Plus JCTD Results: Evaluation of Energy Saving Technologies for Expeditionary Shelters				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) US Army Research, Development and Engineering Command (RDECOM),US Army Natick Soldier RD&E Center,Natick,MA,01760				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES 7th Bi-Annual DOD JOCOTAS Meeting with Rigid & Soft Wall Shelter Industry & Indoor & Outdoor Exhibition, 1-3 Nov 2011, Panama City Beach, FL					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT Same as Report (SAR)	18. NUMBER OF PAGES 11	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

- Objective
 - Determine the best combination of advanced shading, insulation and lighting systems for the most energy efficient shelter.
- Optimized technologies
 - Solar Barrier systems
 - High Efficiency Lighting Systems
 - Advanced Insulation
- The joint demonstration includes shelters and technologies from the Army, Air Force and Marine Corps. All of the branches are collecting and sharing data from the demonstration.





Evaluation Overview



- **Goals**
 - Compare baseline energy usage to energy efficient technologies
 - Evaluate various configurations for optimization
 - Relevant environmental conditions
 - Create a comparative and comprehensive report
 - Power usage will be primary metric
 - Measure KW used by ECU and Internal shelter load
 - Draw conclusions on recommended shelter system configurations
- **Compare results to current baseline tents**
 - TEMPER Baseline onsite and TEMPER Airbeam Baseline on site
- **Actual Fuel Usage NOT Measured**
 - As practiced in the field, measuring amount of fuel delivered would not work because we had multiple fuel sources (on site soldiers did refueling which wasn't tracked)
 - Measuring fuel into generator would only be marginally effective because COTS generators were used and have no direct correlation to the mil-std TQGs used in the field
 - In addition, multiple generators were added as site expanded which were not originally planned for
 - EPCC system also used power and therefore would not accurately reflect fuel used for tents



LSA Warrior Site



UNCLASSIFIED

• **Technologies**

– Solar Barrier Systems:

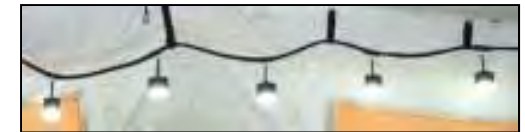
- Ultra Lightweight Camouflage Net System (*ULCANS*)
- Advanced Solar Shades
- Power Shade (including Photovoltaic Panels (2kW))



ULCANS Solar Shade for an Airbeam

– Lighting Systems:

- Fluorescent Lights
- Light Emitting Diodes (Three Sets)
- Electroluminescent Panels



Shelter LED Lighting with Ambience

– Advanced Insulation:

- | | |
|---|---|
| <ul style="list-style-type: none"> • Aerogel Liner • Gas Filled Panel Insulation • Radiant Barrier • Honeycomb Insulation | <ul style="list-style-type: none"> • TEMPER Insulated Liner • Laminated Liner • Quilted Liner • Airbeam Insulated Liner |
|---|---|



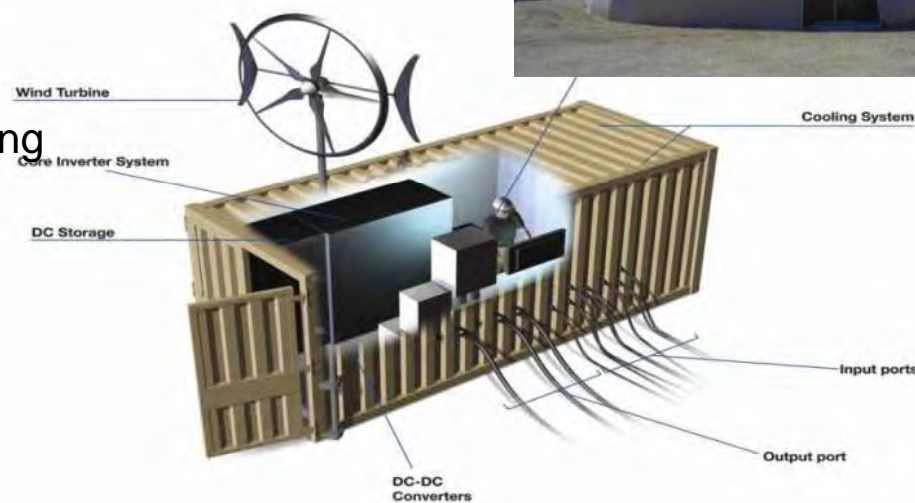
Electroluminescent Lighting System



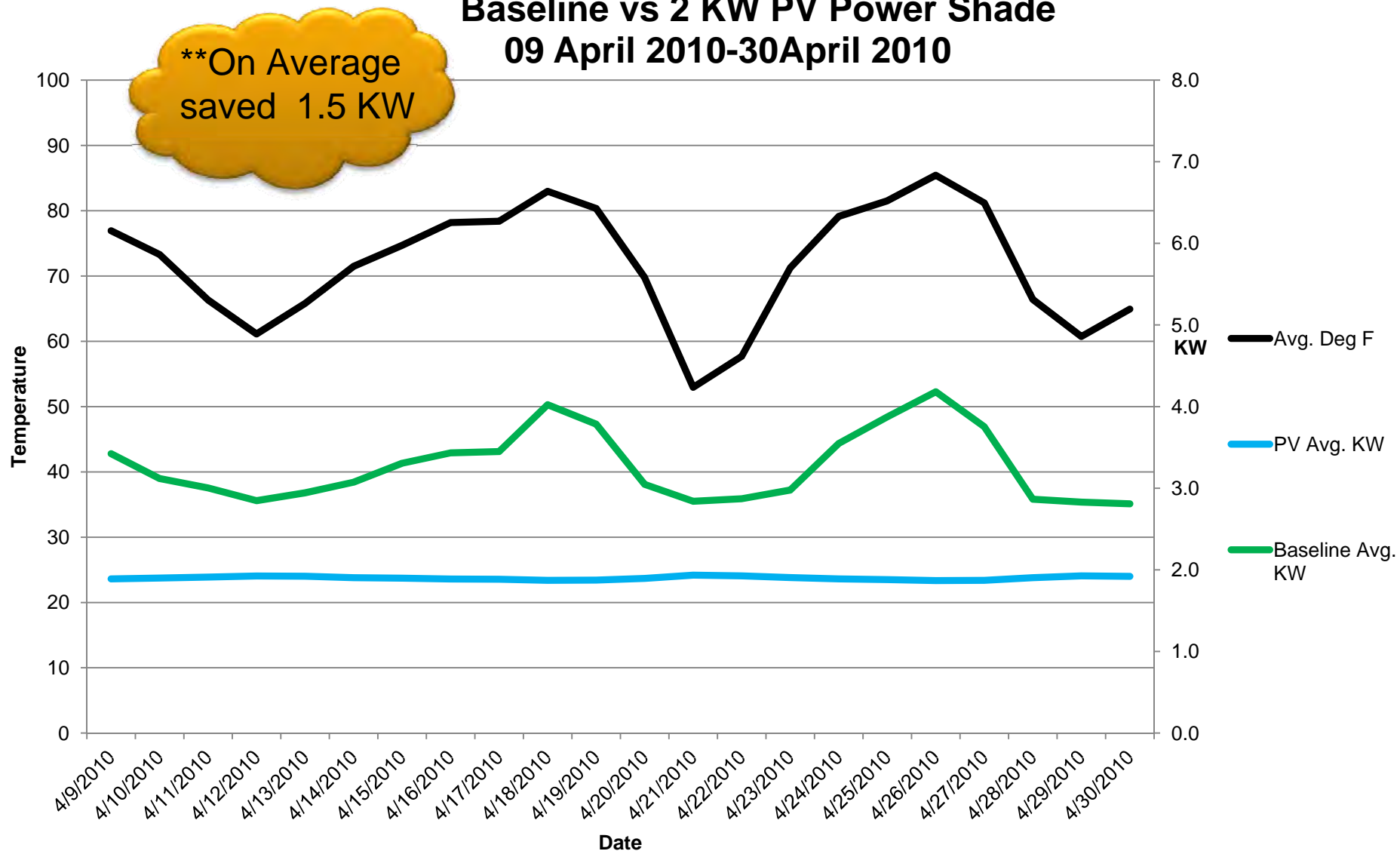
Aerogel Silica Mesh Insulation

- Pyrolysis Solid Waste Disposal
- Solar-Powered Advanced Refrigerated TriCons (SPARTs)
- EPCC
 - Electronic Power Control Conditioning Module
- Micro-grid Systems
 - 1 MW with AC/DC capability
 - Energy efficient generators
 - Accommodates multiple inputs
 - Power quality (conditioning)
- Exterior Spray Foam
 - Tents, buildings
- DREAM
 - LTT-MCC Trailer
 - 250 x BB-2590 U Li-Ion Batteries

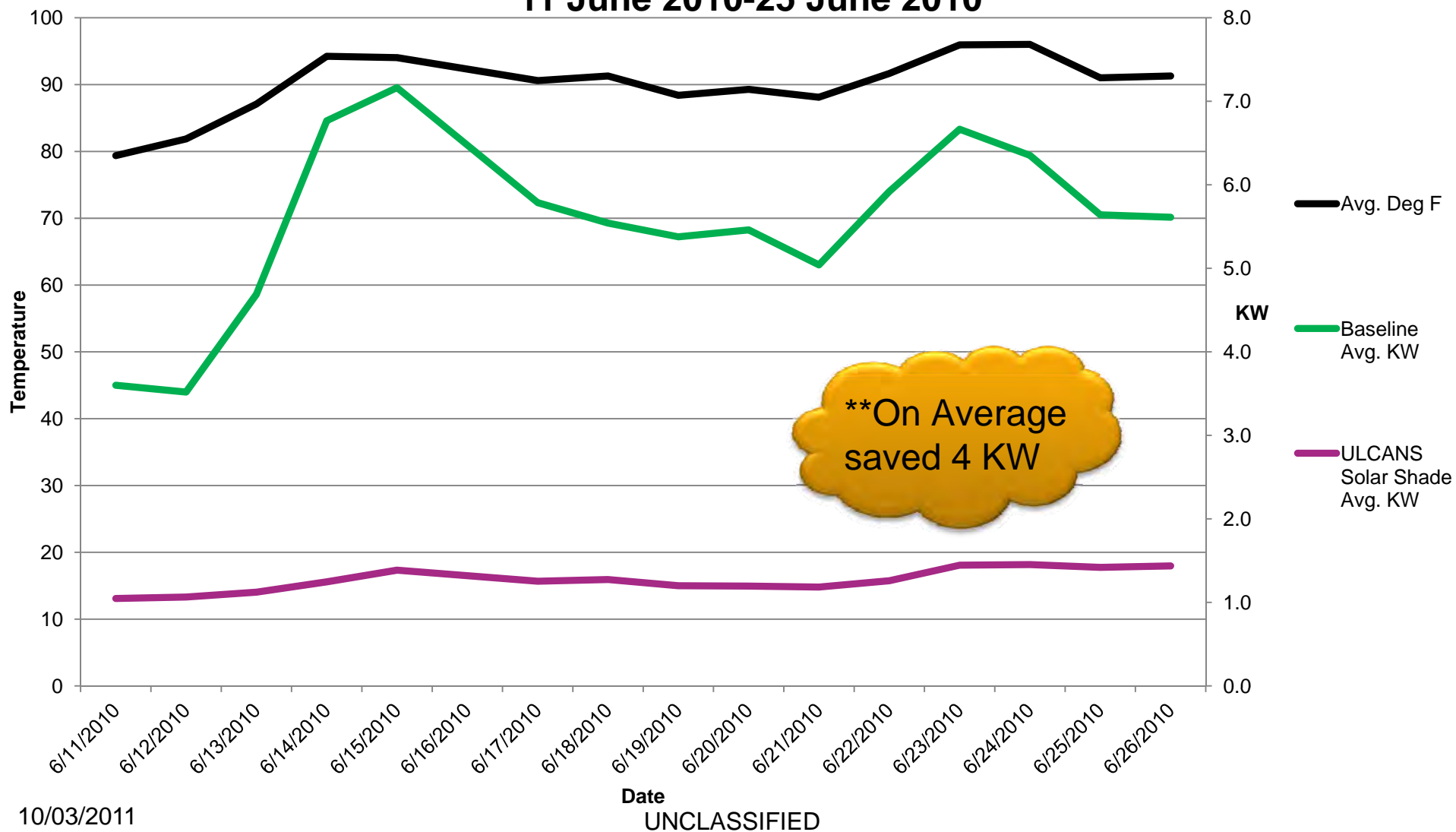
 **The EPCC Module - Electronic Power Control & Conditioning**



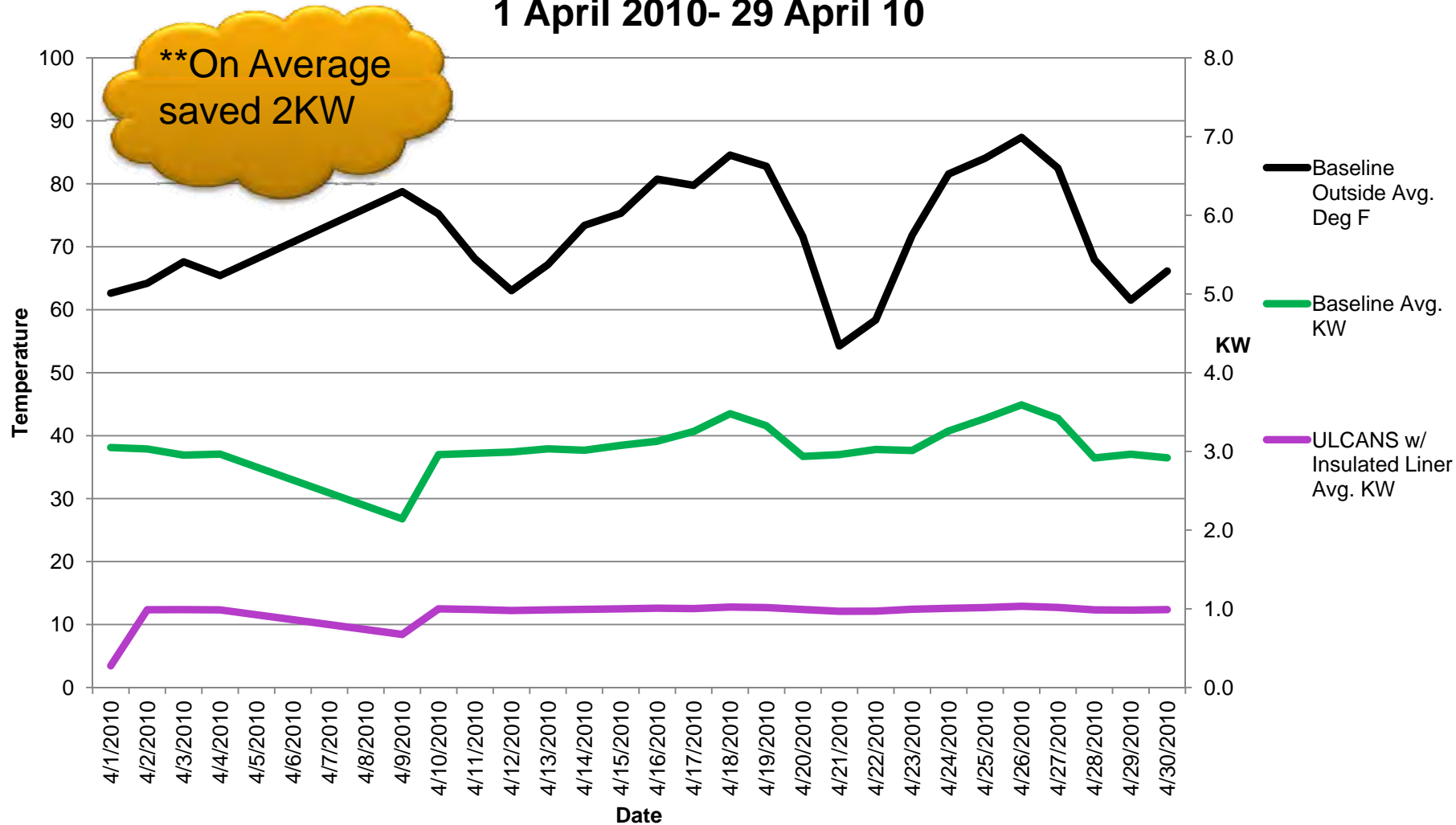
Baseline vs 2 KW PV Power Shade 09 April 2010-30 April 2010



Baseline vs ULCANS SolarShade 11 June 2010-25 June 2010



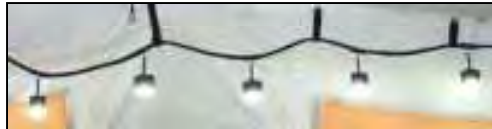
Baseline vs ULCANS w/ Insulated Liner 1 April 2010- 29 April 10



- **Shading systems are critical in the summer months for reducing power consumption up to 30%**



- **Insulation is critical in the winter months for reducing power consumption up to 30%**
- **Received Soldier feedback on the technologies**
- **Soldier Preference**
 - LED Lights
- **LED prototype systems did not significantly save power.**
 - Technology is improving rapidly
 - Continually watching the technology for improvements
- **Transition new configuration of ULCANS to PM-FSS– Reduced foot print**
- **Evaluated multiple Liners For PM-FSS**



Questions?

**Net Zero Plus JCTD:
Evaluation of Energy Saving
Technologies for
Expeditionary Shelters**

Laura Biszko
Special Projects Team
NSRDEC

UNCLASSIFIED